

# Advance Equipments, Techniques and Materials Used In Construction Industry

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*Abstract—In this Research Paper, We have tried to show the factors because of which the Indian Building Construction Industry along with the infrastructure Industry is under great pressure to meet the demands on time at a very great pace. These factors are greatly driven by the Massive Population of India which is still growing at a steady rate. In this Condition to provide Basic needs of Home for Residing, Offices for Working and other Highly Essential Infrastructure Facilities like Schools, Hospitals, Market, Well Connected Roads, Railways, Airports, and Harbors etc. has become a Great Challenge before the Indian Construction Industry. To add salt to the wound, This Challenge has become even more Challenging by the fact that still at Present Majority of the Indian Construction Industry is still relying on Traditional Methods of Execution which in turn are more dependent on availability of Good Sufficient amount of Labours and less dependent on Machines. Even though, India worldwide is the second Most populous nation in the World after China and has the biggest amount of Labour Force in the World. But even after this, The Indian Construction Industry struggles badly in case of Construction Labour due to following factors, Majority of the Construction Labours in Indian Construction Industry are not the Professional Ones or Specialized Ones which are available in the Industry all throughout the Year. They are basically belonging from the Farmer Communities or Fishermen Communities who are mainly depended upon their Individual Irrigation for their Income. They usually move to the Construction Industry during their respective uncultivable period of the Year. Due to which majority of them are unskilled due to lack of training and second there is no reliability as to they have been doing different types of work in different projects. Due to which inspite of having experience they cannot be awarded with a particular skill. All these mentioned factors play a major role as to why Construction Projects in India both in Real Estate and Infrastructure are not able to complete within the given period of time and hence get delayed. Second Biggest Issue of having Untrained Labours on Site is Uncontrolled Wastage of Materials and Poor Quality of Finished Product, which again acts as a setback for the Construction Industry. Hence, in this Condition, The Indian Construction Industry has to implement new Advance Construction Techniques, Equipment's and Material which are less Dependent on Labours but has more involvement of Machineries. Its Biggest Benefit will be that Indian Construction Industry will be less dependent on Labour. Force and will be able to complete the Project at a faster deliver speed with all the Quality Benchmarks getting satisfied. But the Biggest Obstacle in having Machines in Construction Industry is their Huge Initial Investment which may prove fatal if the Right Machinery is not Selected for a Given Site or if selected, as compared to the Project Cost, fits too costly and is completely unfit for other Projects. Hence In this Research Paper, we have discussed all these factors in detail and have tried to show which are the economical methods by which advance techniques, equipments and materials can be incorporated in the Industry.*

**Keywords—**Construction Industry, Indian Building Construction Industry, Infrastructure Industry, Real Estate, Traditional Methods, Advance Construction, Equipments, Techniques, Materials, Planning Commission, Budget etc.

## I. INTRODUCTION

The Indian Construction Industry does not only have to meet the requirements but also has to fulfill the required Quality Standards and Parameters. In this Scenario, Adopting Advance Methods and Techniques in Construction Industry has become crucial.

This is simply because the Traditional Methods at present in use in Construction Industry is too inadequate to meet the speed and quality requirements of the Current Situation.

The Building Construction Industry of India, especially the Real and Commercial Estate is highly dependent on Labour Force for its Execution Purpose with marginal contribution of Machines expect Some Big Construction Organizations. Hence, According to an Analysis Data, it has been concluded that 35% of the Total Construction Cost of a Project is spent on Labour.

Construction Labours in India are basically from the Farmer Community of Rural India who are only available during the Uncultivable Part of the Year. And Also There is no Guarantee that once they Left the Site for going Village Purpose, They will return back to the same Site after the Cultivation Season. Hence the Availability of the Construction Labours on the Site all throughout the Year becomes a Major Challenge for the Site Managers.

On the Other Hand, Due to Untrained Construction Labours improper handling and lack of knowledge, Wastage of Material also becomes very high. Hence Quality of Standards are impossible to meet if remain dependent completely on Labours.

## II. LITERATURE REVIEW

A review on need of implementation of modern construction techniques and equipment in Indian construction sector. Anirban Deshmukh ( June, 2017 ) Post Graduate, Department of Civil Engineering (Infrastructure), Birla Institute of Technology & Science, Pilani, Rajasthan, India. In this Paper Presentation, The Author has discussed about several challenges that the Indian Construction Industry is facing at present due to outdated Traditional Construction Practices. Here the Author has discussed on factors which play an important role in the Selection of the Equipment.

Regarding this, the author has also shown in the paper, the Description of the Selection of the Equipment by giving a sample example. Here the Author has also shown detail about ISM (Interpretive Structural Modeling) which also acts as a Good Tool for the Selection of the Equipment. Here the Author has also discussed as to how Productivity and Safety at Work can be increased, if the Selection of the Equipment is done properly.

However, in this Research Paper the Author has not given any detail about advance materials, their benefits of using



over traditional construction Materials. Moving in this direction in our paper presentation We have shown combined benefits of having Advance Construction, Techniques as well as Machineries over Traditional Materials and Practices which are highly dependent on the availability of Sufficient Labours for their operation.

### III. OBJECTIVE

Following are the objectives of this paper

1. To discuss about the Benefits of using Advance Techniques, Equipments and Materials in Construction Industry.
2. To discuss on those Weak Points where Traditional Construction Techniques is proving to be constrain in the path of Construction Industry in its goal of achieving fast pace of progress with the given period of time.
3. To discuss about the ill effects, Construction Industry is facing on relying heavily on Unexperienced and Untrained Labour Force.
4. To discuss about the Challenges Indian Construction Industry is facing in making it rely on Machineries for its execution operation.

### IV. SCOPE

India is a developing country where a massive growth is taking place in the Construction sectors. Since 2000, A Growth of 9% per annum has been continuously observed in the Construction Industry and it is expected more or less, it will grow in the same rate in the coming future. In the GDP Growth of India, Construction Industry contribution has been almost 10 Percentage. It is projected by the New Government Policy that in coming Decade, Construction Infrastructure Industry alone will be having a share of 1000 Billion Dollars. It has become essential as there is tremendous huge requirement for better Transport, Health, and trading facility within the Country. Pressure of having Infrastructure facilities deeply and urgently is being rapidly seen at the Rural Part of India due to which the Planning Commission is all set to allocate a Lion share part of the Total Budget Plan for the rural infrastructure along with large number of power plant projects and other important needs .Regarding Real Estate, Boom in It Sectors and other fast growing services has contributed to the ever rising Residential and Commercial Projects need.

In its Path of achieving the above mentioned targets, the Construction Industry is facing several new challenges that have emerged in various forms like massive number of projects, strict time stipulations quality and safety assurance, unexpected rise in the price of Essential Concrete Materials. Hence the Indian Construction Industry is under tremendous pressure to find an alternative to the traditional Construction Techniques which have become outdated.

### V. METHODOLOGY

Whenever in Construction Industry we think about choosing an advance equipment or material over a traditional equipment or material, Selection Criteria and Factors to be considered for Selection. Criteria becomes the First Obstacle towards moving in that direction.

In this Paper Presentation we would highlight as to what should be those Factors which we should consider while going for the Selection of an Equipment or Material.

Although there are several equipment and materials available in the market to purchase, not all of the equipment are useful for every type of project. Depending upon the work, several equipments or materials can be used and in future for similar type of work they can be used again. Depending on the Work value and volume, we have to decide which equipment has to be chosen and installed to suit for particular project.

Following are the Selection Criteria Factors listed below

A) Produce Less Pollutants in the Surrounding Environment as a Waste Product during its utilization in the Execution of the Project: The Biggest Criteria for a Equipment or a Material to be selected is that it should produce less pollutants in the Surrounding Environment as a Waste Product during its utilization in the Execution Process of the Project.

B) Productivity, Safety and Health Issues: The Construction Industry has always observed high sick leave among workers and as a result has a higher percentage of work related illness. According to Research data, In the European Union Countries, Work involved in Construction Sector constitutes hardly 7% of the Total Works done in all the Sectors. But in case of Accident and Fatality Records, Accidents and Fatalities occurring in Construction Sector are 15 % of the Total Accidents and 20 % of the Total Fatalities occurring in all the Work Sectors respectively, which is too high and doubles the percentage of the Work force involved. Similarly According to an another research data , in United States , fatality rate in Construction is 15.2 per 1 Lakh Workers while in Manufacturing Sector of United States it is as low as 4.2. Also according to that research data, Injury Rate in the Construction Sector of the United States is 7.9 per Hundred Workers which is also high.If an Equipment or Material Selected is Properregarding Health Wise of the Worker using it itself reduces the percentage of possibility ofthe exposure of the Worker to External Injuriesor Infections.

C) Economical Purchasing Cost and utilization of less Time for its Operation in the Execution Process: The Third Biggest Criteria for a Equipment or Material to be selected it should be easily available in the Market at Economical Cost. In case of Machines, if it goes in breakdown its Spare Parts or Servicing Centre should be within the range of the Site so that the breakdown time of the given machine is minimum.

Also, other Factor to be considered is the TimeUtilization required by an Equipment or Material to execute the Work. Advance Construction Equipments or Machines reduces the risk of project delay, decreases the unpredictability nature of project budget. Also Advance Equipments or Materials reduce the number of required Labours for a given work if done by the Traditional Process.

One of the Technique or Tool used nowadays by the Personnel involved in Planning or Management Department for the Effective Selection Process of Equipment or Material is ISM (Interpretive Structural Modelling)

ISM is a useful technique in developing a hierarchy model for the factors influencing selection of construction equipment in Indian as well as Other Countries Construction Sector. It is a great method for establishing relationships among related factors. In this technique, A number of factors can be considered with a complex problem. ISM methodology is

useful to identify direct and indirect relationship among factors. ISM methodology develops a model considering into mutual understanding of relation between factors. ISM technique starts with an identification of factors influencing a specific issue and then proceeds with a group solving process. In the Selection Criteria Process of other Sectors too, ISM Methodology has been adopted.

Following are the Advanced Construction Techniques, Construction Equipment's along with their Advantages, which are used in Building Construction Industry at Present.

- a) Name of the Advance Construction Technique / Construction Equipment – Steel Shuttering Material or Mivan or Mevan or Aluminum Shuttering Material. Work Activity – All Centering Work. Advantages – Works out to be cheaper as more repetition is possible.
- b) Name of the Advance Construction Technique / Construction Equipment – Sand Screening Machine. Work Activity – Masonry, Plastering etc. Advantages – Time saving for Screening and less wastage of Sand.
- c) Name of the Advance Construction Technique / Construction Equipment – Auto ramming Block Machine. Work Activity – Casting of Concrete Blocks for Masonry. Advantages – Increases the Production and Quality remarkably.
- d) Name of the Advance Construction Technique / Construction Equipment – Sand Washing Machines. Work Activity – Concreting, Masonry, Plastering. Advantages – Decrease in Silt Content which results in better plastering and uniform higher strength Concrete.
- e) Name of the Advance Construction Technique / Construction Equipment – Small Capacity Concrete Mixers. Work Activity – Concreting in Upper Floors of High Rise Structures or Towers where it seems highly difficult to transport Concrete by Pumps. Advantages – Decrease in Silt Content which results in better plastering and uniform higher strength Concrete.
- f) Name of the Advance Construction Technique / Construction Equipment – Form Vibrator. Work Activity – Casting of Slab. Advantages – Better Compaction and less Honeycombing of the Concrete.
- g) Name of the Advance Construction Technique / Construction Equipment – Travelling Belt Conveyor / Trolley. Work Activity – Slab Concreting. Advantages – Labour required to transport wet concrete is reduced. Speed of Execution and Quality of Concrete also increases.
- h) Name of the Advance Construction Technique / Construction Equipment – Admixtures & Plasticizers. Work Activity – Concreting and Waterproofing. Advantages – Workability of the Concrete Increases, Strength and Quality of the Concrete Improves and also the Curing Time of the Newly Casted Concrete reduces.
- i) Name of the Advance Construction Technique / Construction Equipment – Pneumatic Tools (Jack Hammer) Work Activity – Excavation in Rock. Advantages – Excavates the Hard Rock with ease where Normal Chisels do not work. Increases the Output of the Work Considerably.
- j) Name of the Advance Construction Technique / Construction Equipment – Use of Computer in Construction Industry. Work Activity – New Software

Tools for Designing, Planning, Estimation like AutoCAD, MSP, Primavera etc. Advantages – Amount of Manual Labour required for the Work has become less and Quality and Speed of the Work has improved.

- k) Name of the Advance Construction Technique / Construction Equipment – Light Weight Blocks and Concrete. Work Activity – Used as Substitute for Traditional Earthen Bricks in Erecting Walls in Structures. Advantages – Reduction of Load, Increases the Progress of Work, Lowers the Handling Cost, Leads to Lighter Structural Design.
- l) Name of the Advance Construction Technique / Construction Equipment – Ferrocement Techniques. Work Activity – Used as Substitute for Traditional R.C.C. Advantages – Higher Tensile strength as compared to R.C.C, Low Economical Cost as compared to R.C.C, Used Mainly in Septic Tanks, Water Tanks etc.
- m) Name of the Advance Construction Technique / Construction Equipment – Precast Components. Work Activity – It is a Factory Made Concrete which acts as a Better Substitution for on Site Prepared Concrete. Advantages – Good Quality Control on Final Product, Better Curing and High Strength due to Proper Casting with the help of Machines, Reduction in requirement of Skill Labour, Increase in Execution Speed, Decreases the Total Project Time of the Project.

## VI. CONCLUSION

In this Case Study Paper, we have tried to look into various factors in which Selection of Advance Equipment, Techniques and Materials can be for achieving the following targets:

1. Timely Completion of the Project
2. Economical Purchase Cost of Equipment, Technique or Material thereby reducing the Direct Cost of the Project
3. Producing Less Environmental Pollutants to the Surrounding Environment of the Project as a part of Waste Product during its utilization operation
4. Less Environmental Hazardous by Providing Better Safety Environment to the Workers Working in the Project
5. Maximum chances of Repetition for other types of Projects
6. Good Depreciation Value or Scrap Value in case of Machineries.

We also tried to discuss in detail about ISM as a better tool as compared to traditional methods of Selection used for Selection of Equipments, Tools, Materials or Machineries.

We also tried to discuss some of the advance Materials or Equipments used nowadays in the Industry along with their Individual Benefits over the Traditional Materials or Equipments used in the Construction Industry.

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